

Mergers in Congested Markets*

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Abstract

This paper analyses the effects of mergers on prices and welfare in markets facing congestion and derives conditions under which a merger is consumer welfare improving, even in the absence of marginal cost savings. In our context a merger basically has two effects. First, it obviously increases market concentration. Second, it makes the new entity a more aggressive competitor. The paper shows that mergers that entail a more efficient use of installed capacity can result in important price reductions. Moreover, even when the post-merger price of the new merged entity increases, the outsiders may respond by decreasing prices and the overall effect may be a consumer welfare gain. Thus, the current merger policy may be inappropriate in these types of markets. From a policy perspective it could thus be argued that the competition authorities should demand less in terms of "standard" merger-efficiencies in order to approve the merger in a congested market, and especially when there are synergies in terms of capacity utilization.

Keywords: Mergers, Congestion, Capacity Utilization.

JEL-classification: K21, L40

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1 Introduction

There is widening consensus among jurisdictions with competition laws that "the basic objective of competition policy is to protect competition as the most appropriate means of ensuring the efficient allocation of resources -and thus efficient market outcomes- in free market economies".¹

Mergers are important for society since they can deliver important efficiencies as a result of economies of scale and scope or improved resource allocation (i.e. more resources in the hands of better managers). If these merger-efficiencies are of significant magnitude, reductions in production costs can be passed on to consumers, resulting in lower prices. This is known as the competitive effect of a merger. However, mergers can also have important negative effects on consumer welfare. As a consequence of the reduction in the number of market players, firms increase their market power, which can result in price increases. This is known as the anti-competitive effect of a merger. Thus, the overall effect of a merger on consumer prices, and thus consumer welfare, depends on which of the two effects dominates.

The welfare effects of horizontal mergers in a homogeneous product industry where firms interact "à la Cournot" and entry is not allowed, are extensively discussed in Farrell and Shapiro (1990). The authors demonstrate that in such an industry any merger that does not create synergies raise prices. The reason is that the concentration causes the merged firm to reduce output, and although the non-merging firms increase output in response, such increase is not enough to restore pre-merger levels of output. Thus, overall output falls and price increases. However, if the merger achieves efficiencies - a reduction in marginal cost- such efficiencies can offset the anticompetitive effect of the merger on prices. Moreover, if cost reductions are large enough output increases and price falls. Likewise, when firms compete "à la Bertrand" and products are differentiated substitutes, in the absence of entry, product repositioning or efficiencies, Deneckere and Davidson (1985) demonstrate that any merger would cause the merging firms to increase the prices of their products, behaviour that is mirrored by the remaining firms. On the other hand if the merger results in reductions in the marginal cost of the merging parties by a sufficient amount, it would cause all prices in the industry to fall.

The assessment of the trade-off between competitive and anti-competitive effects is a central concern for competition authorities. Under current merger regulations, most jurisdictions use what is called a consumer welfare standard², which implies that a merger should be deemed unlawful, and thus blocked, if its

¹OECD/GD (96) 65, Paris 1996

²Other jurisdictions, among them Canada, Australia and New Zealand, use a total welfare standard, where merger effects on consumer and producer surplus are weighted and a merger is approved if the overall effect is positive.

likely effect is to increase prices (i.e., reduce consumer welfare). In this study we will argue that this policy may not be optimal when applied to markets with congestion problems, since an increase in the price of the merging firms is not necessarily correlated with a deterioration of consumer welfare.

Congestion means that the utility from consuming a good or service is negatively affected by other peoples' consumption of the same good. Underlying the negative externality is some kind of capacity restriction. For example, for a given fleet size, the waiting time of a taxi cab firm is increasing in the number of other users. Similarly, flights are less likely to be overbooked the smaller the number of other passengers. Other examples can be found in telecommunications, tourism (e.g., competing holiday resorts) and in other markets for transportation services (see e.g. Vickrey (1969)). A different type of congestion, which may occur in markets for prestigious brand-name goods, is brand-name debasement (see e.g. Veblen (1899), and Hirsch (1976)).³

Moreover, congestions has been analysed within different fields of the economic literature. For example, Lee and Robin (2001) study the effects of congestion on market structure, while Maddison and Foster (2003) analyse congestion in the context of museums and estimate the congestion cost posed by the marginal visitor to the British Museum. de Palma and Lindsey (1998) and Arnot et al. (1996) assess the role information plays on users decisions regarding the usage of congestible facilities and Kikuchi and Ichikawa (2002) study the impact of congestion on communications networks on international trade. These are just a few examples of recent research focusing on the impact congestion has on economic issues.

The consideration of reciprocal externalities is important in the analysis of oligopolistic markets since they tend to affect the strategic interaction of firms, an issue analyzed in Häckner and Nyberg (1996).⁴ The main conclusion of this study is that equilibrium prices in congested markets tend to be higher than the socially optimal level despite the negative externality induced by congestion. The reason is that congestion reduces the profitability of price-cuts which, in turn, follows from the fact that the benefit of consumption is decreasing in firm demand.

In this paper we study merger effects on prices and welfare in markets where firms face congestion problems, it is, we focus on congestion at firm level. Specifically, we argue that mergers in this type of industries may be relatively less harmful from a social point of view. Adding the capacities of two firms reduces the congestion problem and makes the new entity more aggressive in the market. Hence, average prices may go down even in the absence of "standard"

³For a more general discussion of optimal taxation in the presence of negative consumption externalities, see Sandmo (1995).

⁴Also, see Scotchmer (1985a) and (1985b) who discuss competition between private clubs subject to congestion.

merger-efficiencies.⁵ If there are synergies in terms of capacity, this may lead to a situation where 1) all firms reduce prices or 2) the merged firms increase price while outsiders reduce prices. Hence, unlike standard Bertrand (or Cournot) markets, prices may move in opposite directions and the overall welfare effect of a merger may be positive even when the merging firms are likely to increase price and even when there are no standard merger-efficiencies present.

Synergies in terms of capacity may for example occur in markets for transportation. Doubling the fleet size of a taxi-cab firm could very well result in a more efficient use of available capacity since it takes less time to reach the customers when cabs are more densely distributed geographically. Similarly, the inconvenience of an overbooked flight may very well be small if alternative slots are available close in time to the most preferred departure time. From a policy point of view it could thus be argued that the competition authority should demand less in terms of standard merger-efficiencies in order to approve a merger in a congested market, and especially when there are synergies in terms of capacity utilization.

The effect of having post-merger prices of merging and non-merging firms moving in opposite directions may appear counter intuitive at first glance, especially when goods are strategic complements. However, this reaction is the consequence of the capacity expansion of the merging firm that reduces congestion, enabling it to serve more consumers before congestion becomes an issue. If the reduction of the externality is of significant magnitude, the market power effect can be counteracted and prices of the merging firm will fall, otherwise the market power effect dominates and prices will increase. On the other hand, the outsider firms, as result of the competitor's increase in capacity and higher ability to serve consumers, reduce prices to counteract the increased competitiveness of the new entity, providing their customers with a lower price.

This paper is related to studies of merger effects in markets where firms face capacity constraints. However, the main difference with this study is that congestion does not imply capacity constraints in the absolute sense. That is, firms are able to deliver the service, but the value of the service for consumers decreases as congestion increases, while in the presence of capacity constraints a firm is completely unable to deliver the service once demand exceeds the firm's capacity. Froeb et al. (2003), based on the Central Parking-Allright merger⁶, analyze merger effects⁷ among firms facing congestion, by developing a numer-

⁵ According to the EU Merger Guidelines, the "Commission considers any substantiated efficiency claim in the overall assessment of the merger". However, excluding efficiencies in R&D and innovation, the guidelines focuses more on cost efficiencies that lead to reductions in variable or marginal cost that would in turn, result in lower prices for consumers. See "Guidelines on the assesment of horizontal mergers under the Council Regulationon the control of concentrations between undertakings" February 2004. Official Journal of the European Union.

⁶ United States vs. Central Parking Corp., 99-0652,D.D.C. filed March 23, 1999.

⁷ As in the current study, merger effects in Froeb et al. (2003) are calculated as the difference between pre- and post-merger equilibrium prices and welfare

ical model of price-setting behaviour among multi-product firms differentiated by location and capacity. One of the interesting results of their numerical experiments is that capacity constraints on merging firms attenuate merger price effects by much more than capacity constraints on non-merging firms amplify them. In other words capacity constraints on merging parties are likely to be more important than constraints on non-merging firms in determining the merger effects. Thus, the authors criticize the merger divestiture requirements on the Central Parking-Allright merger.

In our analysis we argue that mergers in congested industries may induce merging firms to use capacity more efficiently, which may put important competitive pressure in the industry, resulting in price reductions and consumer welfare gains. Thus, divestiture may turn out to be not the best remedy if what we are after is efficiency and consumer welfare gains.

Congestion can also be seen as a problem of capacity shortages during peak hours. An example of a merger case where congestion, or capacity constraints at peak hours, may have represented a problem can be found in BP-Amoco/Arco Case⁸. This case concerned the market for transportation of natural gas, from the gas fields to the processing facilities in the geographical area of the North Sea south of latitude 55 N. The merger raised competitive concerns since the merged entity would own most of the pipelines with spare capacity, and congestion was known to already exist in the remaining pipelines creating a dominant position in the market. As a result of these concerns the merging parties had to divest the equity interest they held in gas transportation infrastructure for the merger to be approved.

Another example can be found in the British Telecom/MCI merger case⁹, where competitive concerns were raised in the market for international voice telephony services in the UK-US route. There was a capacity shortage on existing transmission facilities between the UK and the US and the merger would result in a reinforcement of a dominant position of the merging parties. Despite the fact the European Commission acknowledged "the benefit from the more efficient use of transmission capacity", divestiture was required as condition for clearing the merger.

The remainder of the paper is divided as follows. In Section 2 the model is presented and the post-merger price equilibrium is characterized. Section 3 analyses the welfare implications of a merger while Section 4 concludes.

2 The Model

⁸See EU merger case number IV/M.1532, BP Amoco/ Arco

⁹See EU case number IV/M856, British Telecom/MCI

2.1 Pre-Merger Equilibrium

Häckner and Nyberg (1996) study firms' strategic behaviour in a market with congestion. In their model, there are n symmetric firms and consumers, who are identical, maximize utility by consuming two types of goods. One type is available in a number of different brands of identical intrinsic quality, while the other type is a composite good representing the consumption of everything else. All firms have the same marginal cost, $c_i = c$ for all i , and for simplicity we assume $c = 0$, and the decrease of utility of additional consumptions is parameterized by α . Finally, β measures the impact of the negative externality.

Under the conditions above, it is shown that there is a unique symmetric equilibrium price, p^* , and equilibrium quantity, q^* , for the brand good (the good with negative externalities in consumption) such that

$$p^* = \frac{\beta}{2\alpha(n-1) + 2\beta} \quad (1)$$

and

$$q^* = \frac{n(2\alpha(n-1) + \beta)}{2((n-1)\alpha + \beta)(2n\alpha + \beta)}. \quad (2)$$

The main conclusion in Häckner and Nyberg (1996) is that equilibrium prices in congested markets tend to be higher than the socially optimal level despite the negative externality induced by congestion. The reason is that congestion reduces the profitability of price-cuts which, in turn, follows from the fact that the benefit of consumption is decreasing in firm demand. Equations (1) and (2) are derived in basically the same way as the post-merger equilibrium prices and quantities of Section 2.2.

2.2 Post-Merger Equilibrium

In this section we will model how a merger in a congested markets will affect prices.¹⁰ Through this section we will characterize the post-merger demand for

¹⁰Rationalizing why mergers occur is beyond the scope of this paper. There are several reasons for this. From a theoretical point of view profitability is not a perfect predictor since firms may have strategic reasons for merging although it reduces profits (so called pre-emptive mergers, see Fridolfsson and Stennek (1999)). Also, reductions in *fixed* costs may be as important in terms of explaining mergers as increases in variable profits. Finally, the endogenous merger theory is still in its early stages and is not adopted for analyzing more than a few firms.

the outsider firms and the merging parties, as well as the post-merger equilibrium prices as a function of exogenous parameters. Furthermore, we will compare post-merger equilibrium prices with the pre-merger equilibrium ones, stressing the importance of the magnitude of the negative externality of the merging parties, on the pricing behaviour of the market players.

As in Section 2.1 there are two types of goods in this market. The first one is available in a number of different brands of identical intrinsic quality, and the second type is a composite good that represents consumption of everything else.

Consumption of the brand-name good increases consumers utility although at a decreasing rate. Additionally, brand producer firms can face different sales levels which in turn affects the congestion each firm faces or the exclusivity of their brand good. Consumers dislike congestion (like exclusivity), thus consumer utility is decreasing in congestion (increasing in exclusivity). In what concerns the composite good, the marginal utility from consuming it is assumed to be approximately constant for reasonable ranges of income. Thus, the utility for a representative consumer that purchases brand name good i can be expressed as

$$U_i = U(y_i, q_i, Q_i) \quad (3)$$

where y_i and q_i denote the consumption of the composite good and of the brand name respectively and Q_i represents total sales of brand i . By assumption $U_1, U_2 > 0$, $U_3 < 0$, $U_{11} = 0$ and $U_{22} < 0$.

There is a large number of identical consumers, thus the individual demand of a consumer buying from firm i can be derived by maximizing the utility of a representative consumer (3) with respect to y_i and q_i , the composite and the brand name good respectively, taking into account that consumers correctly anticipate the equilibrium aggregate sales Q_i , and subject to the budget constraint $p_i q_i + y_i \leq I$. For simplicity, the price of the composite good is normalized to one. Consumers do not internalize the effect of their demand on the price-setting behaviour of the firms, neither the effect of their demand on firms congestion problem.

In this market there are N firms, each of them producing only one brand-name good, that may differ in the level of congestion they face. Given that consumers are utility maximizers they will only buy from the firm that represents the best deal around. Thus, as in Häckner and Nyberg (1996) for given prices, market shares, m_i , will adjust so that customers are indifferent between buying from different firms in equilibrium. If price differences between firms are too big, then the most expensive firms may not attract even a single customer. Thus, n represents the pre-merger number of firms facing a strictly positive demand for a given price vector, \mathbf{p} . Hence, $n \leq N$. However, after a merger the number of

firms in the market decreases to $n - 1$. Sub-index i will refer only to firms with a positive demand, so $i = 1, 2, \dots, n - 1$. Consequently for a given vector of prices \mathbf{p} , consumer indifference, stated in terms of indirect utilities, requires market shares to be such that

$$V(p_1, Q_1, I) = V(p_2, Q_2, I) = \dots = V(p_{n-1}, Q_{n-1}, I) \quad (4)$$

which amounts to $n - 2$ equations. The demand of a representative consumer patronizing firm i is derived using Roy's identity, yielding another $n - 1$ equations. Finally, the market shares add up to 1, so there are $2(n - 1)$ equations altogether. The total number of consumers being normalized to 1, the aggregate demand facing a firm, thus equals individual demand times the market share:

$$Q_i = q_i m_i \quad (5)$$

which can be solved for explicitly using the $2(n - 1)$ equations.

As a result of the merger, the merged entity acquires more capacity which allows it to serve a larger number of clients, compared to its competitors, before congestion becomes a problem. Thus, if β_M measures the impact of the negative externality on consumers buying from the merged firm, and β is defined correspondingly for the $(n - 2)$ outsider firms it must be the case that $\beta_M < \beta$.

For the sake of tractability, consumer preferences are assumed to have the simplest functional form consistent with the assumptions made. Thus, the utility of a representative consumer purchasing brand-name good i can be written

$$U_i = y_i + (1 - \alpha q_i) q_i - \beta_i Q_i q_i. \quad (6)$$

The first term on the right-hand side is the consumption of the composite good, y_i , while the second term gives the quadratic gross utility from consuming the differentiated good, q_i . The last term reflects the disutility from the consumption of others, Q_i , which is assumed to increase in the own consumption of variety i . Hence marginal utility and individual demand depend on exclusiveness. The decrease in utility of additional consumption is parameterized by α , while $\beta_i \in \{\beta_M, \beta\}$ measures the impact of the negative externality. Our specification means that if $\beta_M = \frac{\beta}{2}$ the externality is reduced by half as capacity doubles. Hence, in terms of the taxi cab industry, for given level of demand, waiting time would drop by 50% as the fleet size doubles. If $\beta_M < \frac{\beta}{2}$ there are scale economies in terms of capacity utilization while if $\beta_M > \frac{\beta}{2}$ there are diseconomies of scale.

The individual demand and the indirect utility function of a representative consumer are given by

$$q_i = \frac{1 - p_i - \beta_i Q_i}{2\alpha} \quad (7)$$

and

$$V(p_i, Q_i, I) = \frac{(1 - p_i - \beta_i Q_i)^2}{4\alpha} + I. \quad (8)$$

Thus, expression (4) implies

$$p_1 + \beta_1 Q_1 = p_2 + \beta_2 Q_2 = \dots = p_{n-1} + \beta_{n-1} Q_{n-1}. \quad (9)$$

Equations (5) and (7) pin down the aggregate equilibrium demand faced by each firm, which is given by

$$Q_i = \frac{(1 - p_i)m_i}{(2\alpha + \beta_i m_i)}. \quad (10)$$

Substituting the above expression into equation (9), and considering the two values that β_i can adopt, the equilibrium condition (9) can be expressed as

$$\frac{2\alpha p_1 + \beta m_1}{2\alpha + \beta m_1} = \frac{2\alpha p_2 + \beta m_2}{2\alpha + \beta m_2} = \dots = \frac{2\alpha p_{n-2} + \beta m_{n-2}}{2\alpha + \beta m_{n-2}} = \frac{2\alpha p_M + \beta_M m_M}{2\alpha + \beta m_M} = k \quad (11)$$

where m_M is the market share of the new entity. Thus, in equilibrium, it follows that the market shares of the merging entity and the outsider firms are given by

$$m_M = \frac{2\alpha(k - p_M)}{\beta_M(1 - k)} \quad \text{and} \quad m_i = \frac{2\alpha(k - p_i)}{\beta(1 - k)}. \quad (12)$$

Since the sum of the markets shares must equal unity it follows that

$$1 = m_M + \sum_{i=1}^{n-2} m_i = \frac{2\alpha(k - p_M)}{\beta_M(1 - k)} + \frac{(n-2)2\alpha}{\beta(1 - k)} - \frac{2\alpha \sum_{i=1}^{n-2} p_i}{\beta(1 - k)}. \quad (13)$$

By solving expression (13) with respect to k and substituting this value into (12), we obtain the market shares of the outsider firms, m_i , and the merging firm, m_M , as a function of prices,

$$m_i = \frac{2\alpha\beta(p_i - p_M) + \beta_M[p_i(2(n-2)\alpha + \beta) - \beta - 2\alpha\sum_{i=1}^{n-2} p_i]}{\beta\left[\beta(p_M - 1) + \beta_M(2 - n + \sum_{i=1}^{n-2} p_i)\right]} \quad (14)$$

$$m_M = \frac{2\alpha\sum_{i=1}^{n-2} p_i + \beta - p_M(2(n-2)\alpha + \beta)}{\beta(1 - p_M) + \beta_M(n - 2 - \sum_{i=1}^{n-2} p_i)}. \quad (15)$$

Given these market shares it is straightforward to derive the firm demand functions.

Lemma 1 *The aggregate demand faced by the firms in the market is given by*

$$Q_i = \frac{2(p_M - p_i)\alpha\beta + (2(p_i + \sum_{j=1}^{n-3} p_j)\alpha + \beta - p_i(2(n-2)\alpha + \beta))\beta_M}{\beta(2\alpha\beta + (2(n-2)\alpha + \beta)\beta_M)} \quad (16)$$

$$Q_M = \frac{2\alpha\sum_{i=1}^{n-2} p_i + \beta - p_M(2(n-2)\alpha + \beta)}{2\alpha\beta + \beta_M(2(n-2)\alpha + \beta)} \quad (17)$$

where Q_i is the demand faced by the outsider firms and Q_M the demand faced by the new merged firm.

Proof. Lemma 1 follows directly from substituting equations (14) and (15) into equation (10). ■

Firms maximize profits with respect to price while taking into account the strategic interdependence between price choices. Consequently, the appropriate equilibrium concept is the Nash equilibrium. The profit function of firm i is.

$$\pi_i = (p_i - c_i)Q_i \quad (18)$$

After characterizing consumer behaviour and firm behaviour we can proceed to obtain the market equilibrium prices. Given the marginal cost symmetry of the market participants we assume $c_i = c = 0$ for simplicity.

Lemma 2 *Market equilibrium prices are given by*

$$p_M^* = \frac{\beta[\alpha(2\beta + \beta_M(2n - 5)) + \beta\beta_M]}{2[\alpha^2(n - 2)(3\beta + 2\beta_M(n - 3) + \alpha\beta(2\beta + \beta_M(3n - 7)) + \beta^2\beta_M]}$$

$$p_i^* = \frac{\beta[\alpha(\beta + 2\beta_M(n - 2)) + \beta\beta_M]}{2[\alpha^2(n - 2)(3\beta + 2\beta_M(n - 3) + \alpha\beta(2\beta + \beta_M(3n - 7)) + \beta^2\beta_M]}$$

where p_M^* represents the equilibrium price of the merged firm and p_i^* the price of the outsiders.

Proof. The result follows from inserting the firm demand functions into equation (18) and taking first order conditions. It can easily be checked that the second-order conditions are satisfied, i.e., that π_i is strictly concave in prices. ■

It can easily be checked that the post-merger equilibrium prices p_M^* and p_i^* reduce to the pre-merger equilibrium price (equation (1)) for $n = n + 1$ and $\beta_M = \beta$, i.e., assuming symmetry and inserting the pre-merger number of firms.

The difference between post-merger prices and pre-merger prices crucially depends on the extent to which the merged firm succeeds in reducing congestion, i.e., it depends on the difference between β_M and β .

Figure 1 illustrates the pricing behaviour of firms as a function of the negative externality of buying from the merged firm, β_M . Prices are calculated under the assumption that $\beta = 1$ and for given values of α and n . Hence, β_M can be thought of as a proportion of β . In other words, for $\beta_M = 1$ the merger does not affect the magnitude of the externality while for $\beta_M < 1$ the externality is reduced.

For large reductions in the externality ($\beta_M \leq \beta'_M$) there is a general price reduction by all market participants. However, when $\beta_M \in [\beta'_M, \beta''_M]$ we observe a surprising behaviour. Despite the strategic complementarity of the goods, we can see that the merging firm increases its price while the outsider firms decrease prices as compared to the pre-merger equilibrium, i.e. $p_M > p^* > p_i$.

The relation between prices that is illustrated in Figure 1 can be shown to hold generally.

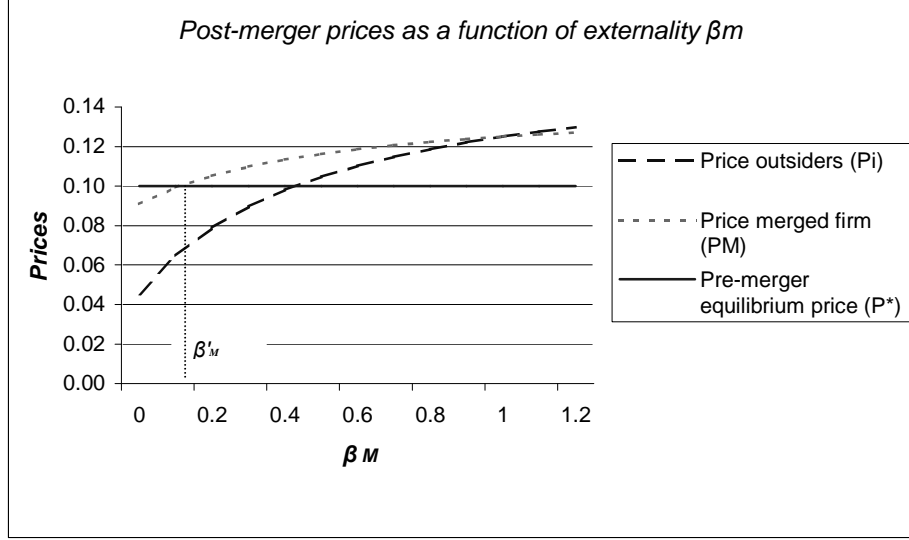


Figure 1:

Lemma 3 p_i^* and p_M^* are both increasing and concave in β_M and $p_M^* > p_i^*$ ($p_M^* < p_i^*$) for $\beta_M < \beta$ ($\beta_M > \beta$), while $p_M^* = p_i^*$ for $\beta_M = \beta$. p_M^* evaluated at $\beta_M = 0$ is smaller than p^* if and only if $n > 4$. Hence, a merger cannot result in a general price reduction unless $n > 4$.

Proof. The first claim follows from differentiation and a straightforward comparison between p_M^* and p_i^* . The second claim follows from a comparison between p^* and the intercept of $p_M^*(\beta_M)$ which reveals that $\text{sign}(p^* - p_M) = \text{sign}(n - 4)$ when evaluated at $\beta_M = 0$. ■

It is worth noting that the price reductions occur in the absence of standard merger efficiencies (i.e., reductions in marginal cost).

The welfare consequences of a merger are fairly obvious if $\beta_M \in [0, \beta'_M]$ since all market players then reduce prices. That is not the case however, if $\beta_M > \beta'_M$.

On the other hand, the relation between β_M and β is also important in determining whether a merger is individually profitable in the absence of marginal cost reductions.

Lemma 4 *There is a unique cut-off point $\tilde{\beta}$ such that a merger is profitable if and only if $\beta_M \leq \tilde{\beta}$. Moreover, $\tilde{\beta} > \frac{1}{2}\beta$.*

Proof. See Appendix ■

Lemma 4 shows that constant returns to scale in capacity utilization are sufficient to ensure that a merger is privately profitable. In fact, mergers are privately profitable as long as there are no large diseconomies of scale in capacity utilization. However, not all profitable mergers will result in welfare improvements, as shown in the following section.

3 Welfare Analysis

Most competition authorities use consumer welfare as a touchstone for antitrust policy. Therefore, in this section we will analyze the welfare implications of mergers in congested markets and derive conditions under which a merger is consumer welfare improving.

As shown above, the externality affects the strategic interaction of market players and a merger that reduces the magnitude of such externality can have important implications for the pricing behaviour of firms. However, the question is under what conditions consumer welfare is improved.

3.1 Pre-Merger Welfare

As presented in section 2.1, the pre-merger equilibrium price and the individual equilibrium demand are given p^* and q^* , respectively. Since consumers are identical, social welfare can be measured by the utility of a representative individual. Given the assumption that $c_i = 0$ the pre-merger equilibrium is symmetric. Hence, all individuals choose the same q , i.e. $Q_i = q/n$, and social welfare W can be denoted as

$$W = y + (1 - \alpha q)q - \frac{\beta q^2}{n}. \quad (19)$$

Lemma 5 *Pre-merger welfare is given by*

$$W = I + \frac{\alpha n^2 [2(n-1)\alpha + \beta]^2}{4((n-1)\alpha + \beta)^2 (2n\alpha + \beta)^2} \quad (20)$$

where I denotes the income level.

Proof. Expression (20) follows directly from substituting the budget constraint $p_i q_i + y_i \leq I$, and the equilibrium values p^* and q^* (given by equations (1) and (2)) into equation (19). ■

3.2 Post-Merger Welfare

First, note that consumers will be indifferent between firms in equilibrium. Therefore, it suffices to analyze the welfare of a representative consumer, for instance a consumer catering to the merged firm. Once a merger has taken place, the post-merger market shares of the market players are given by (14) and (15) for the outsiders and the merged entity, respectively. In equilibrium, all outsiders share the same price. Hence, $\sum_{i=1}^{n-2} p_i = (n-2)p_i$. By substituting p_i and p_M into (14) and (15) we obtain the post-merger equilibrium market shares. As expressed in equation (5) firm demand equals individual demand times the market share, $Q_i = q_i m_i$. Thus, the demand from an individual buying from the merging firm is given by

$$q_M = \frac{1 - p_M - q_M m_M \beta_M}{2\alpha}. \quad (21)$$

Solving (21) for q_M will determine the equilibrium quantity demanded from the merging firm, q_M^* . Thus, the consumer utility from buying from the merging firm is given by $W_M^* = I - p_M q_M + (1 - \alpha q_M) q_M - m_M q^2 \beta_M$. Substituting the post-merger equilibrium values for the market share, the price and the quantity of the merging firm, we obtain the post-merger equilibrium welfare level,

$$W_M = I + \frac{\alpha A^2 B^2}{4C^2 D^2}. \quad (22)$$

Where

$$\begin{aligned} A &= (\beta + \beta_M(n-2)) \\ B &= \beta^2 \beta_M + 2(n-2)\alpha^2(3\beta + 2(n-3)\beta_M) + \alpha\beta(2\beta + (4n-9)\beta_M) \\ C &= \alpha\beta(3(n-2)\alpha + 2\beta) + ((n-3)\alpha + \beta)(2(n-2)\alpha + \beta)\beta_M \\ D &= \beta\beta_M + 2\alpha(\beta + (n-2)\beta_M). \end{aligned}$$

Equation (22) expresses post-merger welfare as a function of exogenous parameters but due to the complexity of the equation, it is not straightforward to see under which circumstances a merger is welfare enhancing. However, as shown in the proof of Proposition 1 post-merger welfare is a decreasing function of β_M . A typical relation between pre-merger and post-merger welfare is illustrated below

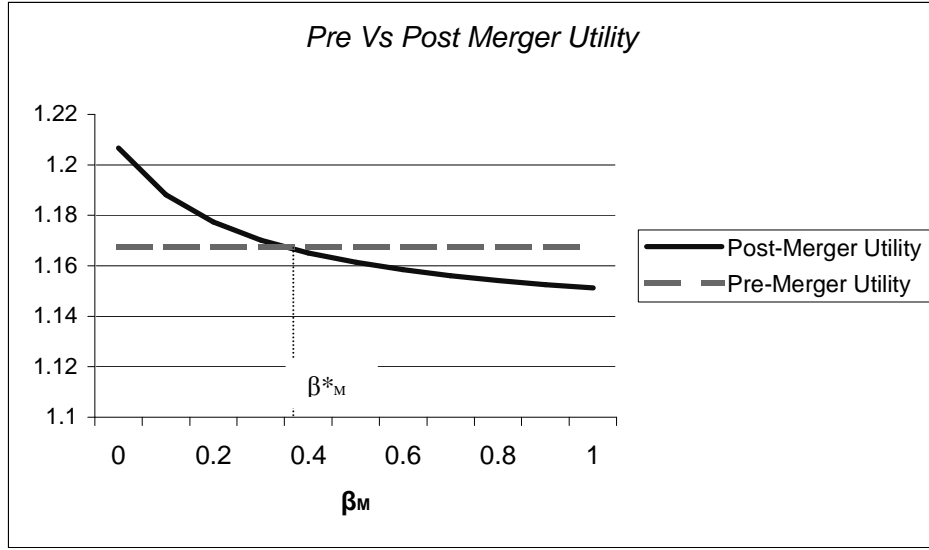


Figure 2

Figure 2 shows a comparison between pre- and post-merger welfare as a function of the externality of the merged entity, β_M , for given parameters and under the assumption that $\beta = 1$. A merger is welfare improving for β_M values to the left of β_M^* . However, for values to the right of β_M^* , the merger, absent efficiency gains, results in consumer welfare deterioration.

3.3 A Welfare Comparison

In the previous subsection, it was shown that post-merger welfare can be higher than pre-merger welfare, even in the absence of standard efficiency gains (i.e., marginal cost reductions), depending on the value of the externality of the

merging firms, β_M . In this section we show that this result holds more generally. In other words, we derive the conditions under which a merger in a congested market can be welfare improving even in the absence of marginal cost savings.

Proposition 1 *For $n > 2$ there is a unique cut-off point $\beta_M^* > 0$ such that $\beta_M < \beta_M^*$ implies that post-merger welfare is higher than pre-merger welfare and viceversa. Merger to monopoly is never welfare improving.*

Proof. Since both congestion and post-merger prices increase in β_M , post-merger welfare must decrease in β_M . It can easily be checked that W_M evaluated at $\beta_M = 0$ is larger than W , if and only if $n > 2$. Noting that $W_M < W$ when β_M is infinitely large completes the proof. ■

The above Proposition, establishes that there exists a set of values of the externality β_M , for which a merger will result in welfare gains for consumers. Nevertheless, Proposition 1 also implies that no value of β_M will be sufficient to offset the anti-competitive effect of a merger to monopoly. On the other hand, even when we have established that a merger fulfilling the condition that $\beta_M < \beta_M^*$ will be welfare improving we have not delimited the values of the cut-off point β_M^* .

Proposition 2 *A merger is welfare improving if and only if the merger delivers increasing returns to scale in capacity utilization. I.e. for the merger to be welfare improving, the merged entity must reduce the externality β by more than half, $\beta_M^* < \frac{1}{2}\beta$.*

Proof. Pre-merger and post-merger welfare are given by equations (20) and (22) respectively. Substituting $\beta_M = \frac{1}{2}\beta$ in equation (22) and subtracting this expression from equation (20) we get the following expression:

$$pre - post = \left(\frac{(8(n-2)(n-1)n\alpha^3 + (11 + n(16n-33))\alpha^2\beta + \alpha\beta^2(10n-11) + 2\beta^3)}{4((n-1)\alpha + \beta)^2(2n\alpha + \beta)^2(2(n-2)n\alpha^2 + 3(n-1)\alpha\beta + \beta^2)^2} \right) \\ \left(\frac{n^2\alpha^2\beta(\alpha + n\alpha + \beta)}{4((n-1)\alpha + \beta)^2(2n\alpha + \beta)^2(2(n-2)n\alpha^2 + 3(n-1)\alpha\beta + \beta^2)^2} \right)$$

which is positive for any value of $n \geq 2$. Additionally, $\lim_{n \rightarrow \infty} (pre - post) \rightarrow 0$ and $\lim_{\beta \rightarrow 0} (pre - post) \rightarrow 0$. Hence, the difference between pre-merger and post-merger welfare for $\beta_M = \frac{1}{2}\beta$ can be made arbitrarily small. Consequently β_M^* can be arbitrarily close to $\frac{1}{2}\beta$ but it can never exceed $\frac{1}{2}\beta$. ■

Proposition 2 implies that in absence standard efficiency gains (i.e., marginal cost reductions) the merger must deliver efficiency gains in terms of capacity

utilization that are more than proportional to the expansion of capacity. For example, if two taxi cab firms merge and fleet sizes double, waiting time must be reduced by more than 50 % for a given level of demand. Furthermore, the result stated in Proposition 2 is robust to any standard applied by the Competition Authorities. Also under a total welfare standard, for a merger to be welfare improving, it must deliver efficiencies that are more than proportional to the expansion of capacity.

4 Conclusions

Mergers are important for society as they can deliver important cost savings that can be passed on to consumers in the form of lower prices. However, mergers can also increase the market power of the merging firms allowing them to charge higher prices. The assessment of these two effects and the overall effect of the merger is crucial in merger control decisions. Under current merger policy, a merger should be deemed unlawful, and thus blocked, if its likely effect is to increase prices. This paper analyses the effects of mergers on prices and welfare in markets facing congestion, and shows that the current merger policy may be inappropriate in these types of markets.

First of all, when a merger results in a significant reduction of the congestion problem (a reduction in the negative externality), the merger can be welfare improving even in the absence of marginal cost savings. This comes as a result of the capacity increase following the merger, which allows the new entity to behave more aggressively in the market, behaviour that is mirrored by outsider firms.

Under certain conditions, the merged firm will increase its price while outsider firms reduce prices. This result is not only interesting from the theoretical point of view, since the price behaviour of firms is unlike standard Bertrand or Cournot markets, but the result also has potential important policy implications. In such situations, a price increase of the merging firm does not necessarily imply a welfare loss since the remaining firms reduce prices and the overall welfare effect could be positive. Therefore, under current merger policy a welfare-improving merger could be blocked since the price behaviour of outsider firms is overlooked.

Thus, we argue that mergers in congested markets may be relatively unproblematic from a welfare perspective. Also when there are no synergies in terms of capacity utilization the welfare loss of a merger may very well be moderate due to the strategic effect from increased aggressiveness. Therefore, from a policy perspective it could be argued that the competition authorities should demand

less, in terms of standard merger-efficiencies, in order to approve a merger in a congested market, and especially when there are synergies in terms of capacity utilization.

This paper has explored the effects of mergers in congested markets and their policy implications. However, the present analysis has only focused on one aspect considered in the merger guidelines, namely post-merger price behaviour. Thus, there are still other potential areas of research, such as the effects of congestion on the ease of post-merger collusion or the effect of congestion on post-merger entry barriers, both of which would help deepen our understanding on the effects that congestion may have on market players and its implications for merger policy.

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Appendix

Proof of Lemma 4. Insiders profits pre and post merger are respectively given by:

$$\Pi = \frac{\beta(2(n-1)\alpha\beta)}{4((n-1)\alpha + \beta)^2(2n\alpha + \beta)}$$

$$\Pi^I = \frac{\beta^2(2(n-2)\alpha + \beta)(2\alpha\beta + ((2n-5)\alpha + \beta)\beta_M)^2}{4(\alpha\beta(3(n-2)\alpha + 2\beta) + ((n-3)\alpha + \beta)\beta_M)^2(\beta\beta_M + 2\alpha(\beta + (2-n)\beta_M))}$$

The merger profitability condition is given by:

$$\Pi^I - 2\Pi > 0. \quad (23)$$

Where Π^I is a decreasing function of β_M . I.e. $\frac{\partial \Pi^I}{\partial \beta_M} < 0$. Thus, since Π is independent of β_M , the profitability condition (23) is also decreasing in β_M . Evaluating (23) when $\beta_M = \frac{1}{2}\beta$ and simplifying the expression, we get:

$$\Pi^I - 2\Pi = \frac{\alpha^2(2(n-2)(n-1)(5n-1)\alpha^3 + (17 + n(17n-38))\alpha^2\beta + 2(4n-5)\alpha\beta^2 + \beta^3)}{2((n-1)\alpha + \beta)^2(2n\alpha + \beta)(2(n-2)n\alpha^2 + 3(n-1)\alpha\beta + \beta^2)^2}$$

which is positive for any value of α and β , when $n \geq 2$. ■